

Redesigning Learning Spaces and Credentials for 21st-Century Emerging Tech Careers

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Abstract: With the rise of “Do-It-Yourself” approach, a shift to new paradigms in accessing education has spread out and disrupt the strict linear higher education pathway. Internet and digital technologies changed the approach to learning and teaching. From digital learning to competency-based education, 21st century learners acquire knowledge, skills, and abilities in new ways to meet tomorrow’s workforce needs, in particular in the area of emerging technologies. Additionally, with the influx of nontraditional adult students, these educational innovations can best prepare learners for EmTech careers and provide them a more affordable, convenient, and practical-oriented education without sacrificing quality learning. This paper discusses educational pathways, both informal and formal, to gain knowledge and skills in EmTech as well as addresses the continuous reshaping of higher education to take into consideration various experiences of learning so learners can further their education with credit programs.

Introduction

According to the National Center for Education Statistics, enrollment in degree-granting colleges of students ages 25 to 34 years old increased by 35% between 2001 and 2015. Between 2015 and 2026, enrollment is projected to increase by 11% (Hussar & Bailey, 2018). Additionally, with the computing job industry projected to grow much faster than other industries over the next 10 years, and as EmTech within computing-related fields such as cloud computing, AI/ML, cybersecurity, data science, robotics, and mobile computing develop further, many skilled jobs may be threatened (The United States Bureau of Labor Statistics, 2017). Therefore, there is a fast-growing interest to bring the largest untapped talent pool, nontraditional adult students, into the computing pipeline through both formal and informal learning settings. The demand for computing jobs throughout the nation can only be fulfilled by creating opportunities for them to upskill or reskill so they can make their way back to the workforce. Using technology-based instruction and other tools, such as industry-specific applications to increase lifelong learning and age-friendly experiences, is important to connect returning learners to industry-relevant content, resources, and applications (Hansen, Talmage, Thaxton, & Knopf, 2019). By doing so, learners become skilled in cutting-edge technology that give them a competitive advantage in obtaining fast-paced, high-paying jobs upon receiving credential validation. Hence, it is timely to build the capacity of returning learners by enabling them to (re-)enter the computing related academic degrees, so they can fill the void of the next generation of computing jobs. However, academia has a very rigid structure which offers little to no access to diverse pathways for returning learners. Although there has been an increase in the number of informal learning pathways to enter the computing fields, there is no solid understanding of how such informal learning paths enable adult learners to develop new technical skills and knowledge which provides more opportunity to rewrite their career paths (McCartney, Eckerdal, Moström, Sanders, Thomas, & Zander, 2010).

Alternative Education Pathways

Nontraditional learners are more likely to have work and family affecting their pursuit of higher education (Gault, Reichlin, & Román, 2014). Considering the responsibilities facing this student population, this presents an opportunity for these learners to be referred to or seek out alternative education options to develop employer-defined skills for tomorrow's workforce. Over the years, alternative education pathways have grown and diversified using experiential education and self-instruction model. Below is highlighted the most pertinent nontraditional options for exploring areas of interest in EmTech at a low- or no-cost before committing to an emerging tech career.

Massive Open Online Courses

Massive open online courses (MOOCs) are known for providing online and self-paced courses for anyone to enroll, with no admission process. Although they are considered as disruptive innovations transforming learning, MOOCs enable everyone to reach their potential through meaningful learning experiences in less time through more flexible formats (Frezza, Pears, Exter, & Lunt, 2018).

Some, like higher education institutions Harvard and MIT, offer online lecture-style courses conducted by university professors through the MOOCs provider edX at no cost. These MOOCs deliver a seamless university experience with their curated lectures and peer-reviewed assessments, which are actively engaging learners in exploring problems from different angles, using materials in different ways, and ultimately stimulating creative thinking. According to a study conducted over four years, HarvardX and MITx resulted in 30 computing courses taken on average by 20,400 US citizens learners with a median age of 27 (Chuang & Ho, 2016).

Others, like A Cloud Guru and Coursera, provide online video-style courses conducted by industry certified experts at a low cost. These MOOCs deliver hands-on experience with their integration of application simulation lab assessments, which train learners in a multitude of skills and environments toward earning industry certifications in EmTech. The guided simulation labs help learners to obtain real-time feedback on their actions and reflect on the result of changes to a given scenario. For example, Verizon engineers use A Cloud Guru as their self-directed and comprehensive training to achieve industry-recognized certification for cloud fluency and better support toward cloud adoption (ElAssir, 2018).

As MOOCs evolve to converge into micro-credentials, an increasing focus on ways to partner with the private sector has emerged for validating informal learning. Digital badges are a new form of credentials that records the unique achievement of sets of competencies and skills acquired through online activities. For example, EY partnered with Udemy for Business to provide upskill training in EmTech to their employees through digital credentials. This incentive is to better prepare EY employees to do whatever comes next in their workforce (Juo, 2020). Career credentials are becoming more and more prevalent in EmTech. For example, due to a recent report on the high demand for data science skills, IBM partnered with Coursera for the creation of the IBM Data Science Professional Certificate (Malik, 2018). This credential is taught by current IBM professionals and is earned by demonstrating expertise in using the IBM platform, Watson Studio, and the IBM "way of working" through role-related tasks and activities at a specified level of competence. Nanodegrees are credentials specific to a set of skills. For example, Udacity has been the leading online platform in providing beginner-to-career-track programs for EmTech (Watkins, 2016). Such programs are more personalized to the learners as they not only include real-world projects from partnered industry experts but also match learners with a personal technical mentor and career coach.

From the perspective of nontraditional adult learners, the ability to stop and start any course at any given time is the greatest advantage of MOOCs that supports its flexibility and easy access. However, studies have shown that many self-directed learners leave before they have fully explored the MOOCs due to lack of understanding related to content and incentives (Chuang & Ho, 2016; Hew & Cheung, 2014).

Competency-Based Education Programs

With the rise of fine-grained and in-demand skills, competency-based education programs (CBEPs) deliver intensive short-term learning programs that provide nontraditional adult learners with training to quickly master specific employability skills and competencies measured with aptitude tests (Chen, 2017). The rise of CBEPs are far more disruptively than MOOCs for higher education institutions as they widen educational pathways to rewarding careers by upskilling and reskilling and providing employability skills. Within this context, two immersive approaches are considered below.

Accelerated trainings are designed for learners to gain aptitudes toward specific internship requirements; such trainings used to be targeting youth such as teenagers and high school graduates. Nowadays, even adult learners choose this pathway to quickly learn what they need to know based on the changes taking place in the job market and workforce demands. Often these programs are run by industry consultants who deliver learning modules specific to the job position's duties and responsibilities. For example, TechHire offers nontraditional bootcamps in computing and technology that lead to employment by providing free industry-specific training and certifications as well as soft skills coaching (The White House, 2016).

Apprenticeships are designed for learners to gain skills through work-based learning. Such trainings enable companies to train learners onsite and hire them to company-specific needs. The combination of classroom and workplace learning provides learners with real-world experiences and skills by working and contributing to the sponsoring company. The training is tailored to the learners' needs and the company's requirements, and as such better trained employees come out of such programs. Urban Institute is leading the way with their nationally approved competency-based apprenticeship framework funded by the US Department of Labor (Lerman & Elliott, 2018).

The need for alternative educational pathways leading to credentials is immense; yet the capacity to integrate informal learning credits into the present education system to count toward a college degree can be a challenge. If learners can pursue their career interests outside of the college walls at a lower cost in a fast-paced environment, and in many cases experiences that live in the real world, efforts to validate their nontraditional credentials should be made so learners can further continue their education.

Re-Imaging Higher Education Pathways

Although various informal learning settings have proliferated over the past 15 years, the changing landscape of higher education has also given rise to diversify formal pathways for lifelong learners in computing and technology. In addition to traditional formal college education, these kinds of diverse academic paths ultimately re-imaged the landscape of computing higher education and next-generation technology workforce. Many alternate formal pathways to EmTech education offer job-focused training, rigorous applied skills rather than textbook knowledge, competencies to solve real-world problems, strong connections to employers, and clear application of acquired skills to high demand and high wage jobs. In the following subsections, we highlight a few of those most prominent options that enable EmTech-related diverse formal educational opportunities for nontraditional adult learners.

Repackage Coursework

In modern days, information technology degrees are kind of a dime a dozen in the tech world. So many people have them that they no longer stand out. Employers are often looking specifically for the people who can show they have tech skills but do not major in tech-related field. In this context, the rise of global online educational platforms like Coursera, Udemy and such have created another revolution in higher education landscape giving learners many diverse and multidisciplinary skill development opportunities (Baldwin, Barr, Briggs, Havill, Maxwell, & Walker, 2017). Such platforms are supported by the global initiative which helps to build a community along with blended learning with the help of establishing physical networks of space, instructors, and learners globally. Next-generation workforce development in EmTech is also largely dominated by these online platforms due to their useful and rigorous courses. Partnering with elite universities and other entities throughout the world, such platforms provide courses online for any learners to take, furnishing choices for teaching and evaluation that are grounded on the pedagogical investigation. They operate with higher education affiliates to establish a system for learners to supply feedback after the course, to be used by scholars for subsequent enhancements to the course.

Industry-Academia Partnership

Driven by a tight labor market and increasing automation of the 21st century, many major tech companies have created their own postsecondary training and credential programs, largely outside traditional higher education institutions. In an industry-academia partnership, institutions join the educational portal of the company for educators to receive on-going training to stay at the forefront of the new technologies and tools so they can equip learners with skills they need for the job market. Hence, collaboration with the industry to create a tailoring

curriculum has become more critical to produce well-equipped graduates that can fit in the world of EmTech. For example, one prominent industry-academia partnership initiative is Amazon Web Services, which offers an institutionally embedded pathway for educators and educator to gain cloud technology that prepares them to compete for the rapidly growing emerging tech careers in edge computing, machine learning, and big data while pursuing industry-recognized certifications (Johnson, 2019). Another example is Google, which created last year a subsidized online IT support certificate program, which has enrolled 75,000 students (Fain, 2019) to be starting their work in the workforce in the next five years in computing, engineering and technology disciplines. Additionally, many companies are expanding their partnerships with two- and even four-year institutions to offer credit-bearing versions of their content and credential programs which will open the door for thousands of non-traditional learners to join the EmTech workforce.

Curated Degrees

With the rise of non-STEM students interested in the computing and technology fields, many higher education institutions are offering curated degrees. These programs are mostly offered at the master's level for learners who want to work in the workforce without committing 4-6 years towards an educational path (Guzdial & Bruckman, 2018). These programs usually offer two semesters of academic "bridge" coursework to prepare them to take classes with regular computing and technology students. For example, the Align initiative program, offered by Northeastern University, aims at creating a pipeline of graduates with a master's degree in computer science by drawing upon undergraduates with degrees in other disciplines, from English and political science to business and biotech. This degree equips students from a wide variety of backgrounds with both the knowledge and practical skills they need to successfully transition to a career in high tech (Shastri, 2018). Furthermore, many higher education institutions offer degrees that allow combining credits from portable skills and various life experience sources (prior learning experiences such as work and alternative educational pathways, colleges, etc.) to count toward a degree. Some universities offer a shorter bridge program that offers a more convenient way to enter growing fields like EmTech.

College-Credit-Certificates

To keep degrees and skills relevant for future professional opportunities, 21st-century learners build their degree through industry certificates. Earning an advanced certification is always a great way to keep lifelong learners informed about modern and in-demand technical skills (Pierson, Frolick, & Chen, 2001). Through the certificate credit pathways' rigorous exam, and often meeting additional experience requirements, learners can demonstrate mastery by external standards and can make an essential difference in job prospects or career advancement. Due to the potential in certificate-credit pathways, educational leaders in several states have developed short-term certificate programs to provide training that rewards students for completing modules of competencies en route to further certificates or degrees. Many higher education institutions offer a concise certificate program that focuses directly on what is needed to enable students to begin a career in EmTech.

Conclusion

It has become evident in recent times that higher education curricula do not sufficiently cover the expected employment skill needs of current graduates for their employment in the modern technology industry. To assure an appropriately trained and job-ready graduate workforce, the industry's expectations must be incorporated into curriculums offered to students who are hoping to contribute to future technological innovations. At the dawn of the 21st century, due to the rise of the Internet, the transmission of knowledge needs no longer be tethered to a college campus. The technical affordances of cloud-based computing, digital textbooks, mobile connectivity, high-quality streaming video, and "just-in-time" information gathering have pushed vast amounts of knowledge to the "placeless" Web. This has diminished the role of the traditional classroom in millennial learner's educational journey and sparked a robust re-examination in its mission and role within a networked society. Within the context of EmTech, higher education has even advanced more due to its demand by the industry. To create a highly skilled digital age workforce, the focus should be on improving existing academic pathways and developing diverse pathways toward degrees and certifications that provide industry-valued technical skills, less expensive and often online.

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